TECHNISCHE UNIVERSITÄT KAISERSLAUTERN

# ToMaTo on CloudLab

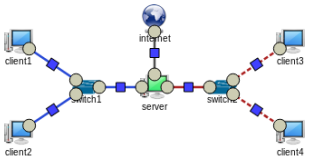
http://tomato-lab.org

IOSY

## ToMaTo - Topology Management Tool

### Topology oriented

- Freely design network topologies




ToMaTo
tomato-lab.org

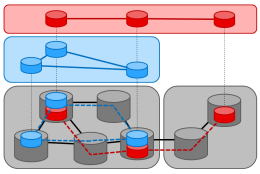
### Fully virtual

- Different virtualization technologies
- Increased resource efficiency

OpenVZ KVM

### Virtual networks

- Layer 2 topologies over the Internet



### Scripted networking elements

- Networking devices written in Python

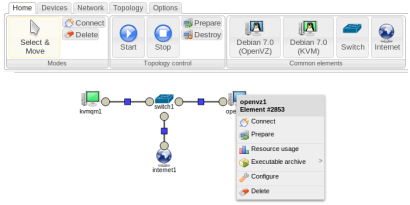
```
#include <layer2/ethernet_proto.repy>

mac_table = {}

while True:
  (dev, packet) = tuntap_read_any(timeout=None)
  ether = ethernet_decode(packet)
  mac_table[ether.src] = dev
  dst = mac_table.get(ether.dst)
  if dst:
    tuntap_send(dst, packet)
  else:
    for dst in tuntap_list():
      if dst != dev:
        tuntap_send(dst, packet)
```

### Intuitive web-based user-interface

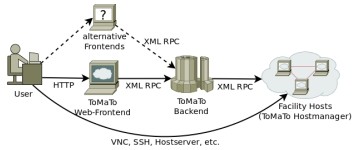
- Topology design using Drag&Drop
- Topology control (start, stop, etc.)
- Interactive experiments
- Easy-to-use




## Testbed on demand

### ToMaTo architecture

- Hosts provide resources
- Backend controls hosts
- Backend deploys topology components to hosts
- Automatic load balancing




### Host deployment on demand

- Start/stop hosts on demand
- Even better: allocate/de-allocate hosts on demand

### Requires backend modifications

- Adaptive load balancer
- Migration of components
- Host deployment logic

## CloudLab usage

CloudLab

### CloudLab provides bare metal machines

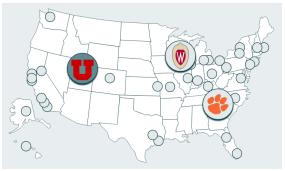
- x86 at Wisconsin & Clemson
- ARM at Utah

### Able to serve as ToMaTo hosts

- All ToMaTo technologies supported on x86 nodes
- ARM nodes require further testing

### Deployment on demand

- Using the provided API
- Based on Debian image
- ToMaTo installation via script



## Ongoing work

### ToMaTo deployment in CloudLab

- Ongoing master thesis
- Deploy ToMaTo hostmanager on CloudLab
- Based on scripts
- Specific to CloudLab API

### Current status

- Proof of concept implementation
- Able to deploy ToMaTo to CloudLab
- Not yet fully included in ToMaTo

### Dynamic ToMaTo deployment

- Ongoing bachelor thesis
- Dynamically (de-)allocate external resources for ToMaTo
- Uses adapters for external resources
- Sophisticated deployment strategy

### Current status

- Deployment algorithm exists
- Needs more testing
- Not yet integrated in ToMaTo

### Other resource sources

- Bachelor and master theses planned
- Bare metal machines still needed for full functionality

### Open questions

- Deployment on virtual machines
- Collaboration model
- Sharing of resources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